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RESEARCH METHODOLOGY IN THE COGNITIVE STYLE FIELD: A REVIEW STUDY IN THE AREA OF BUSINESS AND MANAGEMENT, 1988-2007

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ABSTRACT

This study provides insights into the methodological practices of the field of cognitive styles research over the past two decades and aims to shed light on possible gaps and avenues for future research. Based on a carefully designed selection process, 102 style-related articles within the field of business and management were included in our methodological review study, representing 175 different empirical studies. These studies were content-analysed using a coding scheme that contained the following dimensions: theoretical framework, research design, measurement, and data analytic approach. Our results indicated that research on cognitive styles predominantly takes place in North America (mainly US) and Europe (mainly UK), looking at the affiliations of the first authors and the nationality of the samples. International collaborative studies are scarce. Unsurprisingly, a wide diversity of cognitive style models and measures is used in these studies, although three theories (i.e., Cognitive Style Index, Kirton Adaption-Innovation Inventory, and Myers-Briggs Type Indicator) represent about 60 per cent of the applied frameworks. In terms of research methods, the field of cognitive styles research mainly uses quantitative, cross-sectional, and single-source designs and heavily relies on self-reports, sample surveys, and student samples. While these findings might indicate a potential vulnerability in terms of internal and external validity, we also found a rather strong emphasis on construct validity, exemplified in the fairly high attention for reliability, exploratory and confirmatory factor analyses. Consequently, we encourage cognitive style researchers to work on three particular issues to further enhance the rigour and relevance of the field: (1) triangulation by striving towards more diverse research designs and implementing more diverse ways of data collection; (2) collaboration by increasing both scholar-practitioner cooperation and the number of international collaborative studies; and (3) contextualisation by embodying the context as well as a time dimension in style research, by conducting more multi-sample and longitudinal studies, and by striving towards more purposeful sampling. Although we are convinced of the value of this first systematic methodological review study of the cognitive style field, future similar studies are necessary, extending the scope of the current study to other research domains, a broader time period, and unpublished research, to strengthen and cross-validate our findings.

Keywords: Cognitive styles, methodological review, rigour versus relevance

INTRODUCTION

Cognitive styles, defined as consistent individual differences in ways of perceiving, organising and processing information, are extensively studied across diverse research domains and from differing theoretical and conceptual points of view (Rayner & Cools, 2010; Zhang & Sternberg, 2009a). This has led to an enriching, but sometimes unhelpful diversity of cognitive style theories and measurement instruments (Coffield, Moseley, Hall, & Ecclestone, 2004; Hodgkinson & Sadler-Smith, 2003; Sadler-Smith, 2009a), which makes it fairly complex to get a comprehensive picture of the field of styles research. As rightly observed by different cognitive style researchers, the level of interest in the field waxed and waned over the past 70 years because of the unclear conceptualisation of the concept in relation to personality and cognition, the lack of contact with the field of general psychology, the large number of style dimensions, and the variable quality of some early empirical style research (Kozhevnikov, 2007; Rayner & Peterson, 2009; Zhang & Sternberg, 2009b). Several authors recently made appeals to style scholars to work on particular key issues for the further successful development of the concept and the field in general (Cools & Rayner, 2010; Curry, 2006; Kozhevnikov, 2007; Rayner, 2006; Riding, 2000; Sadler-Smith, 2009a; 2009b). It is clear from these recent calls that the style field needs to continue working on the scientific rigour of its theory and measurement as well as its relevance to increase its value as a field of study within the individual differences psychology (Armstrong & Rayner, 2002; Cools, 2009; Evans, Cools, & Charlesworth, 2010; Rayner & Peterson, 2009), otherwise it may become sidelined by mainstream scientific researchers and left to the indulgences of practitioners (Kozhevnikov, 2007). Ideally, cognitive style research should evolve towards 'pragmatic science' (Cools, 2009), in which high rigour and high relevance are both deemed important (Hodgkinson, Herriot, & Anderson 2001).

However, these calls for the further development of the field of cognitive styles research are predominantly based on thematic rather than methodological reviews of the field, which aim to delineate the content domain of the concept and discuss the 'what' question of cognitive styles research. A next step in the advancement and evolution of the field involves a systematic review of the methodological question of 'how' styles are examined. Although different style scholars discuss the relative advantages and drawbacks of using various research methods within the style field and express the need for using particular research designs and methods (e.g., Ford & Chen, 2001; Priola, Smith, &

Armstrong, 2004; Riding, 2000), these calls for the further methodological development of the field tend to be piecemeal and are not based on any systematic review. To move to pragmatic science, we need to gain further insight into the current levels of rigour and relevance in the cognitive styles field. Hence, the aim of this study is to provide insights into the research and methodological practices that have shaped the field of cognitive styles research through a systematic review of style-related articles within the area of management and business published between 1988 and 2007.

BACKGROUND

Due to the origins of cognitive styles research within the psychometric tradition, cognitive styles have mostly been studied with quantitative research methods, with the majority using self-report measures (Kozhevnikov, 2007; Rayner, 2006). Different style scholars called for increasing the number of qualitative and mixed-method approaches in the field (Priola et al., 2004; Riding, 2000) as well as the use of multisource approaches (Berr, Church, & Waclawski, 2000) to strengthen the rigour as well as the relevance of the style research. Armstrong and Rayner (2002) were the first to call for a paradigm shift in the cognitive styles field, emphasising the importance of bridging the 'relevance gap' between research that emphasises academic understanding (Mode 1) and research that emphasises knowledge produced for the purpose of application (Mode 2). They present a model that refers to validity, reliability, and valence as being three equally important aspects that need to be taken into account in the design of research and in the process of inquiry. Valence in their model means authenticity, credibility, and impact and refers to the extent to which the findings of a study are relevant to a particular context. Validity is concerned with the question of whether we are measuring what we think we are measuring and as a consequence can draw appropriate inferences from our empirical findings. Reliability refers to the degree to which a measurement agrees with itself and is a necessary condition for validity (Kerlinger & Lee, 2000).

According to Creswell (2003), the research approaches scholars can choose from have multiplied over the last two decades, leading to a long list of potential research methods, data collection procedures, and data analytic techniques. The question remains unanswered whether this increased diversity is also represented in the research designs and approaches within the cognitive style field. As there is no systematic evidence yet on how widespread these approaches are within cognitive styles

research, assessing the methodology and research design of style studies will provide relevant insights about the rigour with which data are collected and analysed (Pfeffer, 1993) and in this sense reveal the extent to which the employed methodological procedures allow researchers to make valid inferences (Scandura & Williams, 2000). There are different types of validity relevant in the context of social sciences and organisational behaviour research. Following the example of other methodological reviews (e.g., Austin, Scherbaum, & Mahlman, 2002; Bouckenooghe, De Clercq, Willem, & Buelens, 2007; Buelens, Van De Woestyne, Mestdagh, & Bouckenooghe, 2008; Scandura & Williams, 2000), we use the widely cited Campbell-Cook validity framework (Cook & Campbell, 1976), which encompasses internal, external, construct, and statistical conclusion validity and thus draws attention to research designs, to causes and effects, to the operationalisation and measurement of variables, and to the generalisation of findings. Internal validity concerns the correctness of inferences about causality, which relates to the time frame and chosen research strategy. External validity concerns the correctness of inferences about generalisability, which is for instance influenced by the sample type, the occupation of the research subjects, and the research strategy. Construct validity concerns the degree of correspondence between a construct and its operational definitions, which can for instance be investigated through exploratory factor analysis (EFA), confirmatory factor analysis (CFA), discriminant/convergent/predictive validity, or interrater reliability. Statistical conclusion validity refers to the ability to draw conclusions on the basis of statistical evidence of covariation as well as prediction and is influenced by the sample size, number of dependent variables, and data analytic approaches. Following a consideration of these issues, we will assess the selected studies from the past two decades with regard to their theoretical framework and their research design and methodology, aiming to gain insights about issues such as: which are the most widely used style theories and measures employed; what kind of samples are studied; and which research methods, measurement approaches, and data analytic techniques are chosen?

Subsequently, we explain the methodology that we used, including our rationale for the selection of journals and the collection of articles, and information about the coding process. Then, we present and discuss the results of our methodological review using the five main subsections of our coding scheme: sample characteristics, theoretical framework, research design, measurement, and data analysis. Next, we briefly summarise the general picture that emerges of the field of cognitive style research from this methodological review and suggest three potential avenues for future research that can contribute to increased rigour and relevance of the field. We conclude with some limitations of this study and useful suggestions for similar future research projects.

METHOD

Literature search

Given the broad and multidisciplinary nature of the cognitive styles field, we chose to focus only on cognitive styles research within the context of management and business. We reviewed a wide variety of publications to get an accurate overall view of methodological developments in this field. In the interest of quality, we chose to limit our search to top tier peer-reviewed academic journals, using their impact factor (in 2006) within seven categories of the Social Science Citation Index (SSCI) as selection criterion. The top 50 journals were selected from each of the 'business' and 'management' categories. The top 20 journals were selected from the following categories: 'applied psychology', 'social psychology', 'psychology-multidisciplinary', 'educational psychology', and 'social sciences'. In some cases, a replication of journals occurred across several of these categories, hence the potential list of 200 journals was reduced to 173. Additionally, we also screened the Academic Journal Quality List of the UK Association of Business Schools (www.the-ABS.org.uk) on the basis of the assumption that there may be other relevant journals that are considered by the discipline of business and management to be of a requisite quality, but which are either not registered with the SSCI, or have relatively lower impact factors. This additional screening process led to a further 36 journals being identified, bringing our total to 209.

Selection of articles and criteria for inclusion

We used the EBSCO (mainly business-related journals) and the PsycINFO (mainly psychologically-related journals) search engines to compile an article database spanning two decades (between 1988 and 2007). Given the diverse terminology used within the style field, we restricted our search using the following key terms: cognitive style, thinking style, intellectual style, personality style, and personality type. These terms all fit into the innermost layer of Curry's (1983) taxonomic 'onion' model consisting of three main strata (resembling the 'layers of an onion'). She used this model to differentiate between a variety of theories and constructs such as learning style, information processing style, instructional

preference, and cognitive style. Curry labelled this innermost layer 'cognitive personality style', which she believed to be a relatively permanent personality dimension. Her definition of this layer matches our earlier definition of 'cognitive style' – an umbrella term that will be adopted for the purpose of this study. An open search for the above five terms was conducted, rather than specifying particular fields of an article (for example, abstract, title, etc.). This led to the identification of 822 articles.

The total number of articles was then reduced by excluding those that were: (1) book reviews, comments, editorials, short research notes, columns; (2) articles that did not focus on the concept of cognitive style (many articles referenced the term 'cognitive style' but were more concerned with unrelated aspects such as psychotherapy); and (3) articles that did not focus on topics relevant to the business and management context (such as counselling, education, etc.). Furthermore, we only included empirical articles, so we did not take conceptual papers into account in this methodological review.

After this selection process was completed we had 102 articles that were empirical articles on cognitive styles in the area of management and business and thus relevant for our purposes. Different articles described several separate studies with separate samples. Consistent with other studies, each study from an article describing multiple studies was treated as a separate data-entry (e.g., Aguinis, Pierce, Bosco, & Muslin, 2009; Buelens et al., 2008; Chandler & Lyon, 2001; Scandura & Williams, 2000; Stone-Romero, Weaver, & Glenar, 1995), as these different sub-studies often use different designs or techniques to support, refine, or extend prior findings. Accordingly, 175 studies from 102 articles were included in our methodological review. The set was not intended to be complete and exhaustive, but representative of the field's leading research in the area of business and management.

Coding process

Following the research strategy used in other methodological reviews (e.g., Busenitz et al., 2003; Nakata & Huang, 2005; Stone-Romero et al., 1995), we applied content analysis to analyse our data, as this is considered to be an appropriate technique for review studies. The coding scheme has been developed in alignment with methodological studies in other fields, such as entrepreneurship, management, work and organisational psychology, strategy, marketing, and negotiation (e.g., Aguinis et al., 2009; Austin et al.; 2002; Buelens et al., 2008; Ketchen, Boyd, & Bergh, 2008; Scandura & Williams, 2000). However, we also added various variables that are specifically relevant within the particular field

of cognitive styles research. Coding dimensions included the theoretical framework, research design, measurement, and data analytic approach.

More specifically, we coded the studies along 21 dimensions. First, some general information about the article was coded, related to the number of studies included in the article (single, multiple) (code 1), the type of journal (business and management, education, psychology) (code 2), the number and affiliation (academic, non-academic, mix) of authors (code 3 and 4), the nationality of the first author (code 5), and whether it concerned an international collaborative study (yes, no) (code 6). Second, with regard to the theoretical framework, the main research domain in which the study could be located was coded (code 7) as well as the applied style models (code 8). Third, in terms of the research design, we looked at the time frame (cross-sectional, longitudinal) (code 9), the overall design (quantitative, qualitative, x) (code 10), and the applied research strategy (sample survey, laboratory experiment, experimental simulation, field study with primary data, field study with secondary data, field experiment, meta-analysis, case study, focus group, interview, observation, computer simulation, ethnographic study, judgement tasks) (code 11). Fourth, for the measurement approach, we coded the following aspects: the number of data sources (single, multiple) (code 12), the location of the data (lab, field, simulation) (code 13), the type of data sources (self-report, other-report, observation, behavioural (ratings, outcomes), perceptual task, brain measure, computer-based test, any combination of the previous ones) (code 14), the sample type (psychology students, business/management/MBA students, other students or non-specified, professional educators, managers/business leaders, entrepreneurs/small business owners, public sector employees, private sector employees, consumers, mix, not reported, other) (code 15), the nationality of the sample (code 16), the sample size (code 17), and the used cognitive style measure(s) (code 18). Finally, in relation to the data analysis, we investigated the level of analysis (individual, dyad, team, any combination of the previous ones) (code 19), the nature of the construct validation procedure (reliability estimates, EFA, CFA, effect sizes, manipulation checks) (code 20), and the primary type of data analysis (correlational techniques/association measures (parametric/non-parametric/mix), t-tests (one-sample/dependent/independent), analysis of variance (univariate/multivariate), non-parametric techniques and interpretative data-analysis (chi square), regression, EFA, path analysis/structural equation modelling (SEM)/CFA/multi-group invariance tests, cluster/discriminant analysis) (code 21).

RESULTS AND DISCUSSION

Sample description

Before moving on to the results of the study in terms of theory and methodology, it is interesting to take a further look at the 102 selected articles of this review paper, focusing on three major aspects: number of multiple studies, publication year and type, and authorship.

First, it is interesting to look at the total number of articles (N = 102) in relation to the total number of coded studies (N = 175). As mentioned earlier, we coded each (sub)sample in an article as a separate study in alignment with other methodological reviews. In total, 39 articles (38%) contained more than one study, of which 24 had two studies and 15 three or more studies. This proportion (39/102) seems to be fairly high in comparison with the field of management in general, as Scandura and Williams (2000) in their methodological review of the management field found a ratio of 14/264 for the period 1985-1987 and 16/308 for the period 1995-1997.

Second, in terms of the publication period and types, there is a fairly balanced distribution between the first decade of our review period (1988-1997) and the second decade (1998-2007), with 80 (46%) and 95 (54%) studies respectively. The year 2000 seemed to be the most productive one with 26 (15%) studies. With regard to journal types, the highest proportion (44%) of business and management related style articles surprisingly appeared in psychology journals, closely followed by business and management journals (42%), and another 14 per cent in education journals.

Third, looking at the authorship, three striking conclusions can be drawn: (1) From the first authors, 49 per cent have their affiliation in North America (n = 50, mainly in the US (n = 46)) and 40 per cent in Europe (n = 41, of which the majority in the UK (n = 29)). This means that about 74 per cent of these published articles are from authors from the US or the UK. (2) The number of authors is rather diverse, with three quarter of the articles containing more than one author. More specifically: 42 articles (41%) have two authors, 26 (25.5%) three authors, 24 (23.5%) one author, 9 (9%) four authors, and one article (1%) has five authors. Of the collaborative studies (containing more than one author), 20 per cent is an international collaboration, this is a study with co-authors with affiliations in different countries. (3) The main background of the authors is academic, with 92 per cent of the articles being written by authors with a purely academic affiliation.

Secondly, we looked at the research domains in which the studies have been conducted as well as the style theories that have been used. Table 1 gives an overview of the identified research domains and the number of articles (N = 102) and studies (N = 175) in each of them. A detailed analysis of the research domains is beyond the scope of this paper (see for an overview: Armstrong & Cools, 2009), but it is clear that the last decade has shown an increase of research in the domains of groups/teams and culture. Overall, measurement (i.e., development, validation, and cross-validation of style measures) seems to be a very important research domain within the style field. Interestingly, the use of multiple studies mainly occurs in the domains of 'culture' and 'measurement' (cfr. the huge difference in percentages between the last two columns in Table 1), which seems fairly logical given the nature of these studies. The development and validation of a new style measure or the cross-cultural investigation of the psychometric properties of an existing one usually need multiple samples to derive valid and reliable conclusions.

Insert Table 1 about here

With regard to the applied style frameworks [1], it seems that mainly the following three frameworks have been used in styles research within the business and management field in general: the analysis-intuition dimension of Allinson and Hayes (1996) (applied in 26% of the studies, n = 46), the adaptor-innovator dimension of Kirton (1976) (22%, n = 39), and the four-dimensional framework of Myers and Briggs (Myers, McCaulley, Quenk, & Hammer, 2003) (12%, n = 21). These three models together account for about 60 per cent of the applied frameworks, whereas the other studies use a wide diversity of other models, ranging for instance from Witkin's field dependence-independence model (Witkin et al., 1954) (5%), Epstein's (1991; 1994) Cognitive-Experiential Self-Theory (CEST) (3%) to Riding's (1991) model (3.5%). Only 14 per cent of the studies applied multiple style models in their theoretical framework, while the other 86 per cent adhered to one single style model.

When looking in more detail to the use of the most applied style frameworks, two additional observations are interesting. First, within the 'measurement' category, the models of Allinson and Hayes (1996) (25%, n = 16) and Kirton (1976) (22%, n = 14) take the largest share of the research, meaning that

cross-validation and replication research has been mainly conducted on those two models. As these models have both been specifically designed for use with professional and management groups, this predominance in the area of business and management in general is not that surprising. Second, when comparing the two decades (1988-1997 versus 1998-2007), it is clear that the model of Allinson and Hayes has been used very intensively after its publication in 1996 (n = 8 in period 1988-1997 versus n = 38 in 1998-2007) at the expense of the model of Kirton (n = 30 in 1988-1997 versus n = 9 in 1998-2007) and the model of Myers and Briggs (n = 15 in 1988-1997 versus n = 6 in 1998-2007). Although we do not have a clear explanation for this trend, we believe that this might be due to the fact that both Kirton and Myers and Briggs apply a license system for using their instrument (including an expensive training programme), whereas people might be in need for free instruments for research purposes.

Research design

We found a very strong predominance of quantitative research designs (95%) and cross-sectional time frames (99%). There was actually only one longitudinal study, which is also a qualitative one (Rickards & Moger, 1994). Table 2 gives an overview of the applied research strategies. The field of cognitive style research clearly shows a strong preference for sample surveys (77%), far more than other research fields (e.g., in comparison with numbers lower than 10% in the field of management (Scandura & Williams, 2000) and about 40% within work and organisational psychology in general (Podsakoff & Dalton, 1987)), which is certainly also related to the nature of the field (given its heavy use of (self-report) questionnaires to collect style data as such). Laboratory experiments form the second most chosen research strategy (15%), but following on a long distance from the first choice. The number of field studies is very low (2%), certainly in relation to the field of business and management in general (cfr. about 40% in the management-focused study of Scandura and Williams (2000)).

Insert Table 2 about here

Measurement

We did not only look at the chosen research design and strategy, but also investigated where, how, and from whom the empirical data are collected in the cognitive style field. Table 3 gives an overview of the measurement practices within the field of cognitive styles research, focusing upon the data sources, type of data, data location, type of samples, and sample size. A more detailed examination of this table leads to some interesting conclusions. Almost all studies use a single source (97%) to collect their data, mainly using self-reports (60%) or a combination of self-reports with behavioural data (30%). In terms of data location, there is a fairly equal balance between the 'lab' (56%) and the 'field' (44%), indicating no real difference between collecting data in the 'field' (e.g., sending out a survey to managers in existing companies) and inviting people in a specific 'lab' setting (e.g., students in the context of a course) to take part in a study.

Almost 50 per cent of the studies use diverse types of students; 22 per cent collected data from managers or entrepreneurs, and about 14 per cent contain employee samples. Of these samples, 39 per cent are from the US and 34 per cent from the UK, which implicates that researchers often use 'local' samples for their research purposes (cfr. the nationality of the first authors). Samples from different countries are used in 22 per cent of the studies. Overall, the use of student samples seems much higher in the cognitive style field than within the management field (cfr. lower than 15% in the study of Scandura and Williams, 2000).

The mean sample size of all studies is 214.71 (SD = 243.72), which covers a wide range from 18 to 1,755 participants (median = 136.50). We excluded one outlier to calculate this mean; this was the qualitative longitudinal study referred to earlier that contained only two respondents in their case study design (Rickards & Moger, 1994). About 39 per cent of the studies have a sample size between 100 and 200 respondents, followed by 24 per cent involving 201 to 500 respondents, and 20 per cent 51 to 100 respondents. In general, the average sample size within the field of cognitive styles is smaller than for instance the field of management (M = 428.03, SD = 1,680.10 for the period 1985-1987 and M = 498.31, SD = 1,703.52 for 1995-1997; Scandura & Williams, 2000) or entrepreneurship (M = 1,088.79, SD = 4,661.59; Bouckenooghe et al., 2007), which is mainly due to the much bigger largest sample in these fields (23,170 in the management field and 48,819 in the entrepreneurship field). Overall, the median sample sizes of the three fields are fairly similar (i.e., 173 and 153 in the management and the entrepreneurship field respectively).

Insert Table 3 about here

In addition, given the wide diversity of available style theories and measures (Coffield et al., 2004), we were also interested to know which style measures are used most frequently in the business and management context. Unsurprisingly, given the above finding about the applied style frameworks, the three most often used style measures are the Cognitive Style Index (CSI) of Allinson and Hayes (1996) (25%), the Kirton Adaption-Innnovation Inventory (KAI) of Kirton (1976) (22%), and the Myers-Briggs Type Indicator (MBTI; Myers et al., 2003) (11%). In 86 per cent of the studies only one style measure is used to assess people's cognitive profile, while 14 per cent of the studies combine various measures. Whilst a predominance of three style measures might indicate some convergence within cognitive style studies in the management and business context, the large number of measures used (i.e., 32 different questionnaires) and the low number of studies using a composite or multiple cognitive style measures imply a high risk of divergence, leading to incomparable research findings and difficulties to replicate studies (Cools, 2008; Hayes & Allinson, 1994).

Data analyses

Finally, we report on the major data analytic practices that are used in the cognitive style field to test hypotheses. We subsequently look at the levels of analysis, the nature of construct validation procedures, and the primary types of data analysis (see Table 4 for an overview). Given the nature of the field, it is no surprise that the primary level of analysis in the cognitive style field is the individual (93%). With regard to construct validation, we found reports of reliability estimates in 68 per cent of the studies and reports of effect sizes in 7 per cent of the studies. About one third of the studies refer to exploratory (36%) and/or confirmatory factor analyses (34%). In general, these numbers are much higher than in other fields (e.g., management, entrepreneurship, negotiation), probably again related to the nature of the cognitive style field and its strong origin in psychometrics (Kozhevnikov, 2007). For instance, in 60 per cent of the studies within the entrepreneurship field no indicators of construct validity (e.g., reliability estimates, EFA, CFA) were reported (Bouckenooghe et al., 2007) and this was as high as 75 per cent in the field of management (Scandura & Williams, 2000).

Considering the applied data analytic approaches for hypothesis testing, there seems to be a predominance of rather traditional approaches of data analysis in the field of cognitive styles, with 45 per cent of the studies using correlation or association techniques, 32 per cent t-tests, and 43 per cent analyses of variance. Certainly the use of association measures is much higher in the style field than in the management field in general (less than 7%, Scandura & Williams, 2000) and in entrepreneurship (17%, Bouckenooghe et al., 2007), whereas regression analysis is less often used (30 to 40% within the entrepreneurship and management field respectively). Although more sophisticated techniques are currently available (Hair, Black, Babin, Anderson, & Tatham, 2006), they do not seem to be strongly permeated within the field of style research yet. However, the use of factor-analytic/clustering techniques and structural equation/path-analytic techniques is at the same level or even higher than in the management and entrepreneurship field (Bouckenooghe et al., 2007; Scandura & Williams, 2000). Moreover, the choice for particular data analytic techniques mainly needs to be made in relation to the research problems the study intends to address, irrespective of the level of sophistication, as a match between the research questions and the research approach is necessary (Creswell, 2003). However, increased use of more sophisticated techniques, such as structural equation modelling or path analysis, should be encouraged to strengthen the statistical conclusion validity of the field of styles research (Scandura & Williams, 2000).

Insert Table 4 about here

CONCLUSION

General discussion of findings

We can draw five main conclusions from this content analysis. First, research on cognitive styles can be mainly localised in the UK and the US, based on the affiliation of the first authors and the nationality of the samples. International collaborative studies are scarce. Second, looking at the applied theoretical frameworks, it is clear that some cognitive style models (i.e., CSI, KAI, MBTI) seem to be

more dominant in the context of management and business research than others. Only one sixth of the studies use multiple style frameworks in their research. Third, the field of cognitive style research mainly uses quantitative (95%), cross-sectional (99%), and single-source (97%) designs. Fourth, it heavily relies on self-reports (60%), sample surveys (77%), and student samples (50%). With regard to the last two conclusions, it is interesting to note that similar findings have been reported in terms of the research design (mainly quantitative, cross-sectional, students samples) in recent analyses of the 2007 and 2009 proceedings of the European Learning Styles Information Network (ELSIN) conference (Evans et al., 2010; Rosenfeld & Rosenfeld, 2008). Finally, while these results might both indicate a potential vulnerability to threats posed by internal and external validity issues, we also found a rather strong emphasis on construct validity in the cognitive style field in comparison with other fields (e.g., entrepreneurship, management), exemplified for instance in the fairly high attention for reliability (i.e., reports of reliability estimates in 68% of the studies), and exploratory (36%) and confirmatory (34%) factor analyses. Furthermore, fairly basic data analytic techniques are heavily used within the styles field, such as association measures, t-tests, and analysis of variance. Regression analyses and structural equation modelling are far less common. More sophisticated techniques should be encouraged, as far as they fit the research questions at hand, to stimulate statistical conclusion validity.

Research implications

Based on the results of this methodological review as well as pleas from other style scholars (e.g., Armstrong & Rayner, 2002; Cools, 2009; Evans et al., 2010; Rayner & Peterson, 2009), we would suggest encouraging cognitive style researchers to work on three particular issues to further enhance the rigour of the field and to close the relevance gap referred to earlier: triangulation, collaboration, and contextualisation.

Triangulation

To strengthen the findings of future cognitive styles research, it will be important to strive for triangulation (i.e., cross-verification, cross-examination) with regard to (1) the research design and (2)

data collection. A shift towards more diverse research designs (i.e., qualitative, mixed-method, and longitudinal designs) – in addition to the over-representation of cross-sectional and quantitative designs – provides style scholars with the unique opportunity to strengthen their conclusions and gain deeper insights into the implications of style differences. Priola and colleagues (2004) also called for methodological triangulation in the cognitive styles field to enhance the understanding of the complex phenomenon of people (with different cognitive styles) behaving in particular environments. "Methodological diversity may help the researcher reduce the limitations of the particular view through which the investigation is shaped with the adoption of a different view according to the different method" (Priola et al., 2004, p. 592). Using a variety of methods to study cognitive styles also implies that managerial implications can be made with greater clarity and confidence, as the strengths of quantitative and qualitative strategies are combined in a mixed-method approach, resulting into more robust and generalisable findings (Bachiochi & Weiner, 2002; Shah & Corley, 2006). Bringing in a time dimension in style research will also lead to a higher level of contextualisation as it makes it possible to get a better view on the influencing factors (George & Jones, 2000; Ployhart & Vandenberg, 2010), which will contribute to more specific, applicable, timely and relevant findings for managerial practice (Cools, 2009).

With regard to data collection, self-reports are still the most widely used approach to collect style data, although different ways of measuring cognitive styles exist (e.g., laboratory-based tests, perceptual tasks, physiological assessments, computer-based instruments) (Cools, 2008; Kozhevnikov, 2007). Potential evolutions to go beyond this hegemony of self-reporting include increasing the use of other-source data, such as other reports, behavioural observations, brain imaging techniques, or other neurological/ neurophysiological methods. The advantage of adding these other perspectives is that they do not start from how people perceive themselves, but from how others perceive them or from the actual behaviour or brain reaction that they have. In this sense, a more 'objective' measure can be added to the subjective perception of self-report measures, although other-reports and behavioural observations of course also include an aspect of interpretation.

Collaboration

The last few years have seen an increase in the internal dialogue between people of the style field (Zhang & Sternberg, 2009a) and the number of international collaborations also increased. In this sense, networks of scholars such as the European Learning Styles Information Network (ELSIN) are invaluable to build a strong unified community of practice (Evans et al., 2010). To further increase the relevance of the style field, we believe still higher levels of collaboration are important in the future. Zhang and Sternberg (2009b, p. 297) also acknowledge that "cross-disciplinary and international collaborations would play a pivotal role in further stimulating the field of intellectual styles to become more widely accepted". We see this collaboration possible in two complementary ways.

First, there is a lack of collaboration between academics and practitioners, exemplified by the finding that about 92 per cent of the studies are conducted by people with a purely academic affiliation. However, to bridge the relevance gap in order to create useful knowledge for practitioners, researchers need to bridge some of the assumptional differences that characterise knowledge creation and knowledge utilisation activities in research and in practice (Bartunek & Rynes, 2010; Hodgkinson & Rousseau, 2009; Van de Ven & Johnson, 2006). Starkey and Madan (2001) suggested that the formation of knowledge networks can align the needs of researchers and practitioners, as these knowledge networks involve the practitioners from the beginning of the research process (e.g., formulating the research agenda, choosing the topic and mode of research) and make sure dissemination of research findings takes place as an integral part of the actual research process. According to Amabile and colleagues (2001, p. 418), academic-practitioner collaboration includes "framing research questions in a way that will be meaningful for practitioners, gaining access to sites for field research, designing data collection instruments and methods appropriate for today's workforce, and interpreting results accurately within the business context". This implies that practitioners are not only involved in the knowledge creation part, but also that the findings of research are put in the right perspective, contextualised, and operationalised in such a way that people in practice can actually implement them.

Second, we would like to call for an increase in the number of international collaborative studies. Again, existing networks of style scholars such as ELSIN can play an important role to stimulate this (Evans et al., 2010), both in an informal way and in a more formalised way, this is by the establishment of Research Interest Groups (RIGs) (Rayner, 2008a; 2008b). A RIG consists of a small

group, team or partnership working toward a shared goal: energising research activity targeted at realising greater integration and application of style theories from a multidisciplinary perspective as well as a pragmatic research methodology for use in style research. A RIG offers a deliberate strategic option to take forward the ideas of social cognition and knowledge management as a community of practice (Wenger, McDermott, & Snyder, 2002).

Contextualisation

Just like people do not live and act in a vacuum, we cannot investigate style in isolation. Different scholars called for taking context into account when studying human behaviour, as context elements can have subtle and powerful effects on research results (Chatman & Flynn, 2005; Johns, 2006; Meyer, Dalal, & Hermida, 2010; Rousseau & Fried, 2001). How people behave in learning environments, their job, and organisation does not only depend on their individual (style) differences, but also on environmental factors and the interaction between their style and environmental conditions. A lot of style research still does not take context into account. However, in line with the situational strength hypothesis (i.e., the idea that situational characteristics have the ability to stimulate or restrict the expression of particular individual differences), it is important to take contextual elements into account when studying the relation between individual differences and particular outcomes (Meyer et al., 2010). This idea of interactionism (i.e., behaviour is a function of the interaction between the person and the environment) did receive much attention in theory, but not many empirical studies have been conducted to examine it in detail (Liden & Antonakis, 2009). Hence, it is important to integrate the context in the research design, measurement, and analyses of future cognitive style studies.

In this sense, we would like to call for an increase in the number of field studies and a decrease in the use of student samples (as surrogates for people in real organisations/settings). In addition, research with multiple samples, preferable from different countries or cultures, needs to be encouraged as a way of replication and cross-validation of research findings. Finally, more attention for context also implies more purposeful sampling when conducting empirical style research, as scholars in the field now often use convenience samples. Importantly, enhanced contextualisation of style research also implies specifying in the resulting research reports or articles in what context the findings apply and how the results can be used in practice. It is, for instance, not enough to conclude that style differences have an

impact on management behaviour, but the research also needs to stipulate in which specific circumstances this was (not) the case and how managers can effectively use the results in their management practice.

Limitations of our study

The uniqueness of this study lies in the fact that it is the first systematic methodological review of published articles within the field of cognitive style research. In this sense, it adds justification the many existing critiques with regard to the field's lack of diversity in methodological approaches (e.g., Kozhevnikov, 2007; Priola et al., 2004; Rayner, 2006), as these critiques are not based on a systematic review of applied research methods. Of course, there are limitations to our review that need to be taken into account in future research of the same kind. These limitations are mainly related to the limited scope of this review (i.e., field of business and management, last two decades, only published articles), which might bias the results and prevent the broad generalisation of its findings. In this sense, future similar studies are necessary, extending the scope of the current study to other research domains, a broader time period, and unpublished research, to strengthen and cross-validate our findings. Similarly, a parallel study in the related field of learning styles might also yield interesting additional findings. To conclude, although we are aware of the limitations of our study, we are convinced that this systematic review of the research and methodology within the cognitive styles field contributes to enhanced knowledge and insights about how to further develop the field.

NOTES

[1] An overview of all applied style frameworks is available from the first author. A detailed discussion is beyond the scope of this paper.

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TABLE 1

Studied Research Domains

	1988-1997 (*n* = 80)	**1998-2007 (*n* = 95)**	**Proportion of total number of studies (*N* = 175)**	**Proportion of total number of articles (*N* = 102)**
Marketing	9	7	9%	9.5%
Groups and teams	2	12	8%	8.5%
Decision making	10	4	8%	12%
Management and organisational learning	5	9	8%	14%
Person environment fit and career preferences	5	3	4.5%	6%
Culture	4	20	14%	7%
Entrepreneurship and innovation	3	5	4.5%	7%
Measurement	38	26	37%	25%
People management	4	9	7%	11%

Note. A more detailed analysis of the research themes that have been studied in the field of management and business over the last two decades can be found in Armstrong and Cools (2009).

TABLE 2

Research Strategies

	1988-1997 (*n* = 80)	**1998-2007 (*n* = 95)**	**Proportion of total number of studies (*N* = 175)**
Sample survey	63	71	77%
Laboratory experiment	13	14	15%
Experimental simulation	3	1	2%
Field study with primary data	0	3	2%
Case study	1	0	0.5%
Interview	0	1	0.5%
Observation	0	2	1%
Computer simulation	0	3	2%

TABLE 3

Measurement Practices

	Total number of studies	
	(*N* = 175)	Proportion
Data source		
Single source	169	97%
Multiple source	9	3%
Data location		
Lab	98	56%
Field	77	44%
Data type		
Self-report	105	60%
Self-report + other-report	4	2%
Self-report + observation	3	2%
Self-report + behavioural measure	52	30%
Self-report + computer-based test	2	1%
Brain measure + self-report	1	0.5%
Perceptual task + self-report	1	0.5%
Perceptual task + computer-based test	7	4%
Sample type		
Psychology students	18	10%
Business and management students	23	13%
Other or unspecified students	46	26%
Managers/business leaders	29	17%
Entrepreneurs/small business owners	8	5%
Professional educators	1	0.5%
Public sector employees	7	4%
Private sector employees	17	10%

Consumers	10	5.5%
Mix	13	7%
Unspecified	3	2%
Sample size		
Less than 50	17	10%
51 to 100	35	20%
101 to 200	68	38.5%
201 to 500	42	24%
501 to 1000	10	5.5%
More than 1000	3	2%

TABLE 4

Data Analytic Approaches

	Total number of studies	
	(*N* = 175)	Proportion
Level of analysis		
Individual	163	93%
Team	3	2%
Individual and team	1	0.5%
Individual and dyad	8	4.5%
Construct validation		
Reports of reliability estimates	119	68%
Exploratory factor analysis (EFA)	63	36%
Confirmatory factor analysis (CFA)	59	34%
Reports of effect sizes	12	7%
Reports of manipulation checks	12	7%
Data analysis		
Correlational techniques/association measures	78	45%
t-test	56	32%
Analysis of variance	76	43%
Regression	25	14%
Chi-square	9	5%
EFA	22	13%
Path analysis/SEM/CFA/multigroup invariance test	31	18%
Discriminant/cluster analysis	10	6%

Note. Construct validation procedures and data analytic approaches are dummy coded, as each study can use different procedures and/or approaches. Consequently, the sum of these variables exceeds 100%.